International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(6): 247-249

Received: 04-09-2019
Accepted: 08-10-2019

Kathari Lakshmaiah
Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

M Ganga
Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

S Subramanian
Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

R Santhi
Natural Resource Management, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Corresponding Author:
S Subramanian
Department of Floriculture and Landscape Architecture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Role of post-harvest treatments in improving vase life of lisianthus (*Eustoma grandiflorum*) variety Mariachi Blue

Kathari Lakshmaiah, M Ganga, S Subramanian and R Santhi

Abstract
This study examined the effects of different chemical substances applied to vase solutions on the post-harvest physiology of cut stems of lisianthus (*Eustoma grandiflorum.*). Keeping cut stems of lisianthus in vase solutions containing sucrose, Salicylic acid, NaOCl, ascorbic acid, 8-HQC and their combinations improved the water balance of Lisianthus cut stems ultimately leading to improvement in vase life and floret opening. The results of the study indicated that cut lisianthus responded positively to the treatment combination of Sucrose @ 2.5% + Salicylic acid @ 200 mg l^{-1} + NaOCl 50 ppm, with Favourable vase life (21.92 days), average flower fresh weight (18.35g), physiological loss in weight (21.68) Relative water content (55.880) MSI, RWC. Overall, the results suggest that combination of these sucrose, Salicylic acid (SA), NaOCl chemicals can increase the vase life of lisianthus cut flowers by improving the antioxidant system and reducing damages caused by oxidative stress during senescence.

Keywords: Lisianthus, *Eustoma grandiflorum*, vase life, Salicylic acid, NaOCl, post-harvest physiology

Introduction

Vase life is one of the essential quality parameters which decide consumer preference of a cut flower crop. Lisianthus (*Eustoma grandiflorum*) flowers have gained wide popularity in India in recent decades as a cut flower. However, research reports on the post-harvest physiology of lisianthus flowers are meagre. There are many flowers and buds in the Eustoma inflorescence, hence, it is important to improve the post-harvest performance of the Eustoma inflorescence, encourage bud opening and postpone the open flower senescence. The vase life of cut Eustoma flowers is not long (Cho *et al.,* 2001) [3], and varies among cultivars however, there are few studies of the postharvest physiology of cut Eustoma flowers.

Use of floral preservatives has been reported to reduce the level of postharvest losses in many cut flower crops. Various factors such as unfavourable water balance, development of microbes in the holding solutions *etc*, have been reported as major factors responsible for short vase life in cut flowers. Hence postharvest treatments with compounds witch ensure maintains of favourable water balance and prevention of microbial infestation in holding solution will capable reducing of senescence ultimately leading to extension of postharvest of cut flowers.

The present study aimed at assessing the effect of various postharvest treatments on extending the vase life of cut stems of lisianthus variety Mariachi Blue.

Materials and Methods

Cut flowers of lisianthus (*Eustoma grandiflorum*) variety 'Marichi Blue' grown under polyhouse at the Horticultural Research Station of the Tamil Nadu Agricultural University at Ooty in the Nilgiris District of Tamil Nadu were used for the study. The flower stems were re-cut under tap water to a uniform length of 50 cm and were placed in holding solutions as per treatments (Table 1). All treatments were kept at 20 ± 1°C under a 16:8 h light/dark cycle and 70 ± 5% RH for 18 hours. Control flowers were kept in tap water. Every day the flowers are observed for various postharvest parameters. After observation the flower stalk are kept in the same holding solution. The experiment was laid out in Completely Randomized Design (CRD) with three replications.

Fig 1: Effect of post-harvest treatments on quality and vase life lisianthus variety Mariachi Blue

T1: Control (Tap water)
T2: Sucrose @ 2.5%
T3: Sucrose @ 2.5%+ Ascorbic acid @200 mg l-1+ NaOCl 50 ppm
T4: Sucrose @ 2.5%+ Salicylic acid @ 200 mg l-1+NaOCl 50 ppm
T5: Sucrose @ 2.5%+ Ascorbic acid @200 mg l-1+ 8 HQC @ 300 ppm
T6: Sucrose @ 2.5%+ Salicylic acid @ 200 mg l-1+8 HQC @ 300 ppm

Results and Discussion

1. Solution uptake: The data for average solution uptake are given in Table 1. The maximum uptake (14.33 ml) was noted in T_4 (Sucrose @ 2.5%+ Salicylic acid @ 200 mg l^{-1} + NaOCl 50 ppm) and the lowest (9.15 ml) was in the flower supplied with tap water *i.e* T_1 Control treatment
Preferred solution uptake by lisianthus cut stems incubated with sucrose, salicylic acid and sodium hypochlorite propounds decrease in xylem blockage due to reduced microbial activity. Lower uptake of water by the cut stems is due to occlusions at the basal stem end Similar results were noticed for the above combination of chemical by Kiamohammadi *et al.* (2011) in lisianthus, Hajizadeh *et al.* (2012) [7] in cut rose and Mohammadi *et al.* (2012) in cut tuberose. It may partially be due to its germicidal effect. Effectiveness of SA as an antimicrobial compound can be attributed to its impact on hydraulic conductivity which ultimately controlled vascular occlusions. The opening of lisianthus flowers is associated with substantially increased concentrations of glucose in the corolla. The glucose probably serves to provide osmotic potential for the expansion of the petal cells, and the availability of soluble carbohydrate for that purpose is probably partly responsible for the improved opening of the buds in preservative solution (Cho *et al.* 2001) [3]. The results fall in line with the findings of Kiamohammadi *et al.* (2011) [9] in lisianthus and Hajizadeh *et al.* (2012) [7] in rose hybrid cv. Black Magic.

2. Relative water content (RWC): The data for average RWC of flower are given in Table1. the maximum RWC of flower (55.880) was recorded in T_4 (Sucrose @ 2.5% + Salicylic acid @ 200 mg l^{-1} + NaOCl 50 ppm) and the least RWC of flower (20.547) was recorded by flowers kept in T_1 (control) treatment.
Maintenance of higher petal turgidity in sugar treated flower spikes may be attributed to its role in improving the water uptake by lowering the osmotic potential of flower tissues and decreasing the water loss by closer of stomata (Halevy and Mayak 1974) [6]. Further improvement of RWC due to addition of other preservatives may be due to their effects on preventing microbial growth and cleaning the path of water due to xylem blockage (Singh *et al*. 2000) [14]. Comparatively better results with increasing pulsing duration may simply be attributed to the accumulation of more amount of sugar in the flower tissues (Halevy and Mayak 1974) [6].

3. Average flower fresh weight: The data for average flower fresh weight are given in Table 1. The mean data indicated that the highest flower fresh weight (18.35g) was noted in T_4 (Sucrose @ 2.5%+ Salicylic acid @ 200 mg l^{-1}+NaOCl 50 ppm) where as minimum (14.05g) was recorded by flowers in Control treatment (T_1).
Sucrose as carbohydrate source is essential for regulation of the structure of mitochondria and to maintain water balance.. NaOCl, serves as an antagonist of ethylene and therefore enables increase in fresh weight. Similar results were reported in tuberose by Hutchinsen *et. al.,* (2005) [8]. Thus it could be inferred in the present study that sucrose and NaOCl combination is best compared to the other treatment combinations, for increasing flower weight.

4. Physiological loss in weight PLW): The data for average physiological loss in weight are given in Table 1. It could be noticed that lowest PLW (21.68) was noted in T_4 (Sucrose @ 2.5% + Salicylic acid @ 200 mg l^{-1} + NaOCl 50 ppm) whereas maximum PLW (38.72) was recorded by flowers in Control treatment (T_1).
In more advanced stages, respiratory substrate is more, due to more number of opened florets and because of that respiration rate was higher. The increase in respiration rate directly leads to reduction in weight i.e. weight loss. In early stage of flower development, less ethylene is produced than later stage. All the contributed towards higher flower weight in less advance stage as compared to more advance stage. Similar result have been reported by De and Barman (1998) in tuberose and Singh (2005) [15] in gladiolus, Brahmankar *et al.,* (2005) [2] in golden rod, Mangave (2014) [11] in heliconia and Auty (2011) [1] in orchid.

5. Membrane integrity (MI): The data for average MI of flower are given in Table1.The minimum MI of flower (38.72) was recorded in T_4 (Sucrose @ 2.5% + Salicylic acid @ 200 mg l^{1} + NaOCl 50 ppm) and the maximum MI of flower (38.72) was recorded by flowers kept in T_1 (control) treatment.
These conditions contributed to optimum continuation of the cell metabolism that facilitated cell growth and development, formation of cellular constituents and the liberation of energy for other cellular functions. Further, it reduced water stress and stabilized membrane integrity and cellular structure as indicated by maintained higher membrane stability index ultimately delayed petal senescence and increase the longevity. Use of antioxidants in retaining membrane integrity and for antisenescence effects during aging has been known (Singh, 2005) [15]. M. Kazemi, *et al*, (2011) [10] Thus, antioxidant property of HQC contributed to enhance vase life. Similar effects of improving vase life with 8-HQC and sucrose reported in *Dendrobium* cv. hybrid Sonia-17 (Dineshbabu *et al.,* 2002) [4], in golden rod (Brahmankar *et al.,* 2005) [2] and in gerbera (Patel *et al.,* 2008) [13].

6. Vase life (Days): The data for average vase life (days) of flower are given in Table 1. The longest vase life (21.92 days) was recorded by T_4 (Sucrose @ 2.5% + Salicylic acid @ 200 mg l^{-1}+NaOCl 50 ppm) while the shortest (10.23 days) was observed in T_1 (control) treatment. Holding Lisianthus cut stems in vase solution comprising sucrose, salicylic acid, and sodium hypochlorite significantly increased vase life by slowing senescence.

The rate of respiration is enhanced by ethylene manufacture in the senescing tissues. The vase life extension and increase in fresh weight is due to the supply of carbohydrates by sucrose for respiration process. Keeping the flowers in vase solutions containing sucrose has been shown to extend the vase life of cut flowers as reported by earlier workers (Yamane *et al.*, 2005 and Malik Owais *et al.*, 2017) [16, 12]. Fan *et al.* (2008) [5] showed that salicylic acid extended vase life and improved flower quality with reduced respiration rate, delayed senescence and decreased lipid peroxidation and MDA (Malondialdehyde.) content.

Table 1: Effect of post-harvest treatments on physiological attributes and vase life of lisianthus variety Mariachi Blue

No.	Treatments	Solutions uptake (ml) Day 20	Relative water content	Fresh weight (g) Day 20	Physiological loss in weight Day 20	Membrane integrity Day 20	Vaase life (Days)
T_1	Control (Tap water)	9.15	20.547	14.05	37.42	38.72	10.23
T_2	Sucrose @ 2.5%	11.31	27.897	15.24	30.66	34.87	13.65
T_3	Sucrose @ 2.5%+ Ascorbic acid @200 mg l^{-1}+ NaOCl 50 ppm	13.15	50.307	17.12	33.58	36.73	17.88
T_4	Sucrose @ 2.5%+ Salicylic acid @ 200 mg l^{-1}+NaOCl 50 ppm	14.33	55.880	18.35	21.70	21.68	21.92
T_5	Sucrose @ 2.5%+ Ascorbic acid @200 mg l^{-1}+ 8 HQC @ 300 ppm	11.98	50.173	16.69	31.59	31.80	16.83
T_6	Sucrose @ 2.5%+ Salicylic acid @ 200 mg l^{-1}+8 HQC @ 300 ppm	12.65	52.170	17.63	29.08	26.84	18.83
Mean		16.51	12.09	16.51	30.67	31.77	31.77
SEd		0.409	0.241	0.409	1.098	0.423	1.184
CD at 5%		0.892	0.532	0.892	2.393	0.922	2.579

Conclusion

This investigation demonstrated the potential impact of different chemical combinations on postharvest longevity of cut lisianthus. It could be concluded that the treatment combination involving Sucrose @ 2.5% + Salicylic acid @ 200 mg l^{-1} + NaOCl 50 ppm resulted in better flower quality and vase life of cut Lisianthus (*Eustoma grandiflorum* L.) flowers as a consequence of maintenance of all the physiological attributes in a favourable status.

Reference

1. Auty YK. Standardization of harvesting stage and chemical treatments in orchid cv. 'Sonia Red'. Thesis Submitted to Navsari Agricultural University, Navsari, 2011.
2. Brahmankar S, Dhaduk BK, Singh A. Effect of harvesting stages and chemical preservatives on postharvest life of golden rod (*Solidago canadensis* Linn.) panicles. J Ornam. Hort., 2005; 8(1):23-26.
3. Cho MS, Gelikel MG, Dodgenand Reid MS. Socrose enhances the postharvest quality of cut flower of *Eustoma grandiflorum*, Proc. 7th Int. Symp. Postharvest Physiology of Ornamentals Acta Hortic. 2001; 543:179-183.
4. Dineshbabu M, Jawaharlal M, Vijayakumar M. Influence of holding solutions on the post-harvest life of *Dendrobium* hybrid Sonia-17. South Indian Hort. 2002; 50(4-6):451-457.
5. Fan MH, Wang JX, Shi G, Shi LN, Li RF. Salicylic acid and 6-BA effects in shelf-life improvement of *Gerbera jamesonii* cut flowers. Anhui Agricultural Science Bulletin, 2008.
6. Halevy AH, Mayak S. Improvement of cut flower quality opening and longevity by pre-shipment treatments. Acta Horti. 1974; 45:335-347.
7. Hajizadeh, Alireza Farokhzad, Vida Ghasemi Chelan. Using of preservative solutions to improve postharvest life of Rosa Hybrid cv. Black magic. Journal of Agricultural Technology. 2012; 8(5):1801-1810
8. Hutchinsen MJ, Chebet DK, Emongor VE. Effect of ACCL, sucrose and silver thiosulfate, NaOCl on the water relation and post-harvest physiology of cut Tuberose flowers. African Crop Sci J. 2005; 11(4):279-287.
9. Kiamohammadi M, Hashemabadi D. The effect of different floral preservative solutions on vase life of lisianthus cut flowers. Journal of Ornamental and Horticultural plants. 2011; 1(2):115-122
10. Kazemi M, Hadavi E, Hekmati J. Role of Salicylic Acid in decrease of membrane senescence in cut Carnation flowers. American Journal of Plant Physiology. 2011; 6:106-112.
11. Mangave D, Singh Alka, Jha, Sanjay, Chawla, Shiv. Post-harvest physiology and quality of heliconia inflorescence cv. Golden Torch as influenced by antioxidants. Indian Journal of Horticulture. 2014; 71:232.
12. Malik Owais, Ullah Awan, Nangial Khan, Murad Ali, Muhammad Junaid, Sohail *et al*. Response of cut rose cv. Cardinal to sucrose and NaOCl concentration. Pure and Applied Biology.
13. Patel JG, Valia RZ, Patel ZN, Tandel YN, Vahora AM. Extension of vase life of Gerbera (*Gerbera jamesonii*) cv. 'Bora Bora' through different chemicals. *Abstract*, National Symposium on Recent Advances in Floriculture., N.A.U., Navsari, from 4th to 6th March, 2008.
14. Singh K, Singh P, Arora JS, Mann RPS. Studies on post-harvest management of gladiolus. J Ornam. Hort. 2000; 3(2):107-110.
15. Singh A, Kumar J, Kumar P. Influence of 8- Hydroxy quinoline (8-HQ) and sucrose pulsing on membrane stability and post-harvest quality of gladiolus cut spikes. J Ornam. Hort. 2005; 8(4):243-248.
16. Yamane K, Kawauchi T, Yamaki YT, Fujishige N, Effects of treatment with trehalose and sucrose on sugar contents, ion leakage and senescence of florets in cut gladiolus spikes. Acta. Hort. 2005; 669:351-358.